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Educators Working for Educators

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Content Tools

✓**Text**

Post Assignments, Lectures, Reading Materials, etc.

✓**Multimedia**

Link in Audio, Video, even Slideshows

✓**Threaded Discussions**

Create Weekly, asynchronous discussions

Define a classroom environment

✓**Exams**

Flexible tools which allow students to complete assignments, quizzes, tests, or exams online in a secure environment

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The RAILS Project

REAL • ADAPTIVE • INTELLIGENT • LEARNING • SYSTEM

Project Objective: Improve the Quality of Online Education by

• Making it easier to find and organize relevant
   online educational materials
• Reducing the time required to develop and organize
   online courses
• Building delivery systems that are automatically
   tailored to individual student needs

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Technological Barriers

Current delivery systems compare and evaluate documents via
- keywords
- meta data

Premise: For delivery systems to migrate toward more individualized intelligent tutoring systems, they must "understand" the semantics of the courseware and the student's work.

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Technological Solution

Latent Semantic Analysis (LSA)
- Automated technique that gleans semantic info from text
- LSA scored 64% on the TOEFL exam
- LSA is as good as TA's at grading "Intro to Psych" essays (Univ. of Colo.)
- LSA is being actively applied to many automation problems that require semantic "understanding" of a collection of text (Knowledge Analysis Technologies)

Technological Solution (Cont.)

Radial Basis Functions (RBF)
•A fast learning neural network architecture
•Well-suited for classification problems
•Noise tolerant
•Basis for some emerging internet technologies
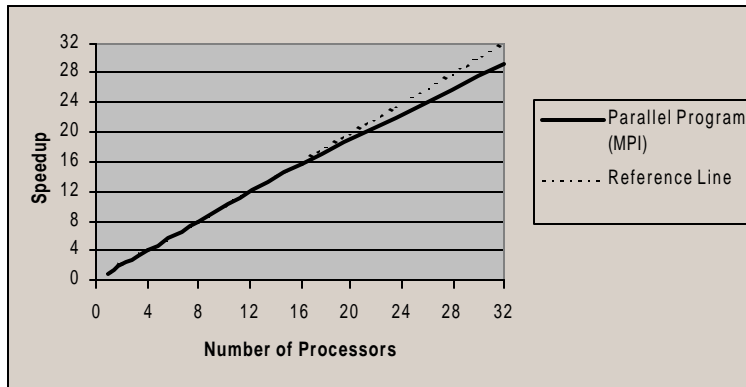(LocateWhatever.com)

The typical LSA document comparison technique is
mathematically equivalent to a RBF neural net with
a single, untrained hidden layer node

Key Technological Innovations

• Integration of
  LSA and RBF

• Implementation on an
  inexpensive, Beowulf
  "supercomputer"

Parallel LSA/RBF

2.3 GFLOPS on LINPACK Benchmark

RAILS Project Deliverables

✓**February 2000:**
- •**"Smart Search" Technology**: improved precision and recall
- •**Meta-Tagging Phase I**: keywords, subject, and content of text documents

✓**February 2001:**
- •**Course Development Aids**: reduce the time to organize online course materials
- •**Meta-Tagging Phase II**: granularity, pre-requisites, and learning level of text documents

✓**February 2002:**
- •**Web-based Intelligent Tutor**: automatically track student progress and alter course delivery based upon individual student capabilities and progress

"Smart Search"

11-Point Recall-Precision
CISI Text Collection with k=200
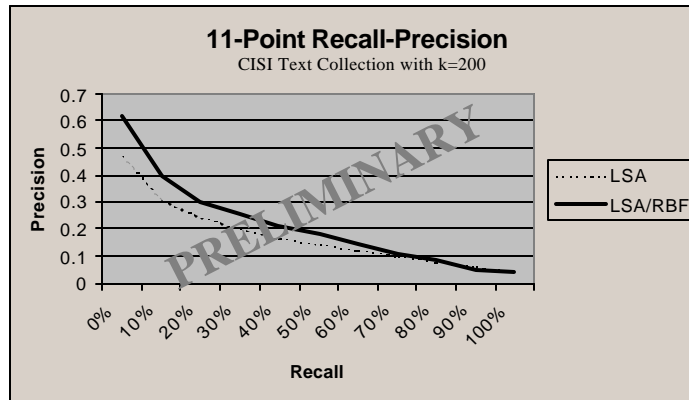
R-Precision is improved by 25%

Meta-Tagging Phase I
An Example from the Cranfield Text Collection

The laminar boundary layer equation: a method of solution by means of an automatic computer

"the laminar boundary layer equation: a method of solution by means of an automatic computer . a method, very suitable for use with an automatic computer, of solving the hartree-womersley approximation to the incompressible boundary-layer equation is developed . it is based on an iterative process and the choleski method of solving a simultaneous set of linear algebraic equations . the programming of this method for an automatic computer is discussed . tables of a solution of the boundary-layer equation in a region upstream of the separation point are given . in the upstream neighbourhood of separation this solution is compared with goldstein's asymptotic solution and the agreement is good"

Keywords: solution ; separation ; layer ; boundary ; method ; equation ; equations ; automatic ; computer ; laminar ; upstream ; differential ; point ; iterative ; digital ; solving ; means ;

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Summary

- The quality of online education with be positively impacted by algorithms developed for the RAILS Project

- ATP/ALS funding was the catalyst that put good ideas into motion

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T H A N K   Y O U !

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